STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION
ALBANY, N.Y. 12232
www.dot.ny.gov

JOAN McDONALD
COMMISSIONER

ANDREW M. CUOMO
GOVERNOR

September 11, 2012

Mr. Ron Rienas
General Manager
Buffalo and Fort Erie Public Bridge Authority
100 Queen Street
Fort Erie, ON L2A 3S6

Dear Mr. Rienas:

At the direction of Governor Cuomo, the New York State Department of Transportation, in collaboration with the Departments of Environmental Conservation and Health, prepared both a summary of key findings and a white paper entitled *Review of Air Quality and Asthma Issues at the Buffalo Peace Bridge Plaza.* The white paper also includes a foreword written by Sarah Siwek on behalf of the Greater Buffalo Niagara Regional Transportation Council.

This whitepaper is a collection of unbiased, factual information regarding the air emissions, public health and air quality monitoring studies surrounding the Buffalo Peace Bridge Plaza.

I am transmitting the key findings and white paper to you for your use as appropriate, to address the public's concerns with the air quality issues.

If you have any questions, please call me at 518-457-4422.

Sincerely,

Joan McDonald
Commissioner

cc: Joseph Martens, Commissioner, Department of Environmental Conservation
Nirav Shah, MD, MPH, Commissioner, Department of Health
Sam Hoyt, Regional President, Empire State Development

# REVIEW OF AIR QUALITY AND ASTHMA ISSUES AT PEACE BRIDGE

## KEY FINDINGS

***In response to community concerns regarding health and air quality impacts related to the Peace Bridge U.S. Customs Plaza, the New York State Department of Environmental Conservation (DEC), Department of Health (DOH), and Department of Transportation (DOT) have compiled an extensive summary of available facts & statistics on this issue. Key points include the following:***

- **Past monitoring and testing has shown air quality in proximity of the Peace Bridge meets current EPA emissions standards**
- **Since such monitoring and testing was completed, additional improvements have been put in place to reduce congestion and further improve air quality**
- **The 2007 EPA Clean Diesel law required full transition to new fuel and engine technology by 2010 for all new diesel trucks, and over 50% of trucks crossing the Peace Bridge are already in compliance**
- **Local data shows that poverty, race, & socio-economic factors (not geographic location) have the greatest correlation to asthma related hospital visits within the City Buffalo**
- **Multiple areas of high asthma hospitalization rates in the City of Buffalo are not located near the Peace Bridge**
- **A study by the Health Effects Institute has stated that the adjacent Peace Bridge neighborhood is not considered an air quality "hot-spot" as emissions levels are similar or better than in other urban areas**
- **Proposed Peace Bridge idling enforcement and air monitoring activity is also considered another positive step towards increased environmental stewardship policies at the crossing.**

STATE OF NEW YORK

# Review of Air Quality and Asthma Issues at the Buffalo Peace Bridge Plaza


*By:* *New York State Department of Environmental Conservation (NYSDEC)*
*New York State Department of Health (NYSDOH)*
*New York State Department of Transportation (NYSDOT)*

*Foreword By:* *Sarah Siwek on behalf of the Greater Buffalo Niagara Regional Transportation Council (GBNRTC)*



**July 2012**

# FOREWORD

## White Paper on Review of Air Quality and Asthma at the Buffalo Peace Bridge Plaza

In response to community concerns about air quality and health-related issues at the Buffalo Peace Bridge Plaza. The information included in the White Paper was obtained from the New York State Department of Environmental Conservation (NYSDEC), the New York State Department of Health (NYSDOH) and the New York State Department of Transportation (NYSDOT) and is a compilation of available information on air quality and asthma in the Buffalo/Niagara region and at this location. The foreword of this document discusses key findings included in the White Paper and was prepared by Sarah Siwek on behalf of the Greater Buffalo Niagara Regional Transportation Council (GBNRTC)

**Overview of Air Quality in the Buffalo/Niagara Region**

Three air quality pollutants can be directly related to vehicular traffic, Ozone, Particulate Matter (PM) and Carbon monoxide (CO). Erie and Niagara Counties are currently meeting all US EPA air quality standards.

Historically, the Buffalo/Niagara region's air quality met all US EPA standards except for ground-level ozone. Erie and Niagara counties were designated as a marginal ozone nonattainment area under the U.S. EPA one-hour ozone standard in 1991. In June 2004, Erie and Niagara Counties were designated as a basic non-attainment area under U.S. EPA's new 8-hour ozone standard. These counties currently attain the U.S. EPA's 8-hour ozone standard.

The ground-level ozone issue is a northeast U.S. regional problem not specific to Western New York. The northeastern states have established emission control programs to reduce the emission of the pollutants that form ground-level ozone; these control programs control stationary sources as well as limiting emissions from vehicle fuels, controls at the gas station to prevent gasoline vapors from escaping while vehicles are refueled and stricter emission controls for vehicles sold in the northeast. A new Peace Bridge Plaza design will not adversely affect regional ozone levels.

On a local level, PM and CO pollutant levels are directly affected by vehicle movements. Particulate matter, specifically $PM_{2.5}$, (particulate matter equal to or less than 2.5 microns in size), is a pollutant that can impact public health (i.e., affect asthma and breathing related problems). Governmental regional air quality monitors indicate that Peace Bridge air quality for PM is better than the existing US EPA health-based ambient air quality standards. No part of the Buffalo/Niagara region has ever been designated as a non-attainment area under U.S. EPA's $PM_{10}$ or $PM_{2.5}$ standards. U.S. EPA recently proposed strengthening the $PM_{2.5}$ standard and EPA does not anticipate that under a strengthened $PM_{2.5}$ standard, there will be any non-attainment counties within the Buffalo/Niagara region. Carbon monoxide (CO) is a common air pollutant produced by vehicle engines and is most often tied to air quality concerns at or near roadway intersections or anywhere vehicles stop and start. Local levels of CO are notably below US EPA health-based ambient air quality standards.

**Key Findings**

- **The Buffalo/Niagara region meets all current U.S. EPA Air Quality Requirements**

Since Erie and Niagara counties were designated in 1991 as nonattainment under the U.S. EPA one-hour ozone standard and in 2004 as nonattainment under U.S. EPA's newer, 8-hour ozone standard the region has been subject to U.S. EPA's Transportation Conformity requirements. This requires an analysis of emissions from mobile sources (e.g. cars, trucks, buses) for the full life of the 20-year Regional Transportation Plan and the analysis must include all regionally-significant projects to be implemented over the life of the Plan. The most recent emissions analysis completed to meet the transportation conformity requirements was completed in March 2010 and included a project which would widen the Peace Bridge from three to seven lanes. The region meets the U.S. EPA Transportation Conformity requirements for the 2011-2015 Transportation Improvement Program (TIP) and for the full period of the 2035 Long Range Plan. Table 1 shows the emissions analysis included in the most recent conformity determination and emissions of both VOCs and NOx (which when combined create ozone) decrease dramatically over the life of the Long Range Plan.

**Table 1**
**Buffalo/Niagara Regional Emissions Analysis**
**Source: GBNRTC -Transportation Conformity Determination May 2010**

| Pollutant Emissions Tons/Day | VOC (Tons/Day) | NOx (Tons/Day) |
|---|---|---|
| 2015 Build | 10.198 | 12.833 |
| 2015 No-Build | 10.351 | 12.905 |
| 2025 Build | 6.566 | 6.396 |
| 2025 No-Build | 6.754 | 6.441 |
| 2035 Build | 7.142 | 5.089 |
| 2035 No-Build | 7.588 | 5.190 |
| % Reduction 2015-2035 | 29.9% | 60.3% |

- **Air quality in the region and specifically at the Buffalo Peace Bridge Plaza will continue to improve in the future.**

U.S. EPA's 2007 heavy-duty engine standards will reduce emissions from diesel trucks by over 90%. Low-sulfur diesel fuel which is now available nationwide, will reduce NOx emissions from diesel fuel very significantly. Traffic operational improvements and limited idling at the Plaza including providing the necessary number of inspection lanes will also reduce localized emissions. The Buffalo/Niagara region meets the U.S. EPA 8-hour ozone standard, which is more protective of public health than the older U.S. EPA one-hour ozone standard and this provides clear evidence that the region's air quality has improved since 1991. Technology improvements in vehicles and fuels and operational improvements at the Peace Bridge Plaza will further reduce emissions dramatically in the future.

These air quality improvements are consistent with air quality improvements nationwide. Table 2 shows the change in annual national emissions per source category (e.g. stationary, industrial processes, highway vehicles, non-road mobile sources) from 1990-2008. As the Table shows, for key transportation-related pollutants there was a 58% reduction in $PM_{2.5}$ emissions, a 39% reduction in

$PM_{10}$ emissions, a 36% reduction in NOx emissions, a 35% reduction in VOC emissions, and a 53% reduction in carbon monoxide (CO) emissions nationwide during this period.

**Table 2**
**Change in Annual National Emissions 1990-2008**
**Source: U.S.EPA**

| Source Category | $PM_{2.5}$ | $PM_{10}$ | $NH_3$ | $SO_2$ | $NO_x$ | VOC | CO | Lead |
|---|---|---|---|---|---|---|---|---|
| Stationary Fuel Combustion | -773 | -813 | +43 | -10,490 | -5,323 | +445 | -228 | -0.42 |
| Industrial and Other Processes | -343 | -217 | -446 | -731 | -144 | -3,150 | -442 | -2.80 |
| Highway Vehicles | -213 | -216 | +153 | -439 | -4,386 | -5,970 | -71,389 | -0.42 |
| Non-Road Mobile | -17 | -24 | -28 | +85 | +474 | -76 | -3,411 | -0.27 |
| Total Change | -1,346 | -1,270 | -278 | -11,575 | -9,379 | -8,751 | -75,470 | -3.91 |
| Percent Change (1990 vs. 2008) | -58% | -39% | -6% | -50% | -36% | -35% | -53% | -79% |

- **Localized Monitoring Data Show Air Quality at the Buffalo Peace Bridge Plaza is Improving**

Two air quality monitoring studies have been conducted to understand air quality at the Peace Bridge Plaza location. The first study was conducted in 2001-2002 by the Buffalo and Fort Erie Public Bridge Authority (BFEPBA), in concert with the Federal Highway Administration (FHWA) and NYSDOT.

The second study was conducted in 2005-2006 by the Health Effects Institute[1] (HEI), a highly respected, independent research organization. Both studies monitored particulate matter ($PM_{10}$ and $PM_{2.5}$) however the HEI study also collected data for more than one hundred individual chemicals known as air toxics. In comparing the sampled data from 2001-2002 with the data collected in 2005-2006, the average incremental traffic related contributions from $PM_{10}$ and $PM_{2.5}$ were 47% and 52% lower respectively in 2005-2006 than in 2001-2002. Sampling time variations (e.g. 24-hour vs. 12-hour) may account for some of these observed reductions but they are also likely related to the reduction in standing traffic at the U.S. Plaza due to the relocation of the toll booth to the Canadian side of the border in 2005. Before 2005, all the tollbooths, customs areas, the Peace Bridge Authority Administration Building, and a duty-free shop were located in the Peace Bridge Plaza on the U.S. side of the border, adjacent to west Buffalo neighborhoods. In early 2005 toll collection was relocated to the Canadian side

[1] The Health Effects Institute is a nonprofit corporation chartered in 1980 as an independent research organization to provide high-quality, impartial, and relevant science on the effects of air pollution on health.

and the tollbooths on the American side were demolished during June and July 2005. Passport control and customs inspection remained on the U.S. side. The old duty-free shop was demolished and replaced by a larger one, located at the intersection of two streets on the edge of the Peace Bridge Plaza.

- **Analysis of Asthma Hospitalization and Emergency Department Data Show No Clear Pattern of Association with High Traffic Areas along Routes I-190 or I-90.**

Asthma is a complex and, unfortunately, common disease. Many environmental, social and genetic factors are known to contribute to the development or exacerbation of asthma, but little is understood about the impact of specific exposures in an individual or a community. The increased asthma hospitalization and ED visit rates in the City of Buffalo (including neighborhoods near the Peace Bridge) could be due to many factors and are likely the result of multiple factors.

These risk factors include socioeconomic characteristics, exposure to multiple outdoor air toxics from other local emission sources, traffic proximity, access to medical care and disease severity among individuals living in the neighborhood. Other risk factors such as family history of asthma, poor indoor environment, smoking, and stress may also have contributed to the high asthma rates in this area. Although there is no cure for asthma, asthma attacks can be prevented and controlled with proper care. New York is actively working with health care providers, community coalitions, schools, families and many others to fight asthma so people with asthma can live a full and active life. For more information about New York's Action against asthma: www.health.ny.gov/diseases/asthma/ny_action.htm.

Among the four zip codes in the region with the highest asthma hospitalization rates, only one zip code is in the vicinity of the Peace Bridge; it is over a quarter of a mile away and is not located downwind from the Peace Bridge. Annual daily traffic counts (2008) are lower in the immediate vicinity of the Peace Bridge compared to other segments of I-190 and I-90 and do not show a clear association with areas of the City of Buffalo most affected by high rates of asthma hospitalizations or Emergency Department visits.

**Conclusion**

Improvements at the Peace Bridge Plaza will aim to reduce or eliminate vehicle waiting time, idling and backups at customs inspection stations while also accommodating an increase in the number of vehicles using the Plaza. These improvements in combination with the continued implementation of the motor vehicle air pollution regulations (e.g. cleaner vehicles and fuels) are expected to result in improved air quality at the Peace Bridge Plaza and within the surrounding community.

The NYSDEC and the Public Bridge Authority are partnering together to implement an air quality monitoring program at the Peace Bridge Plaza. This monitoring data can be used to assess improvements in air quality for the local community as a result of improvements made at the Peace Bridge Plaza and the continued implementation of motor vehicle air pollution regulations over time.

## Table of Contents

## I. Introduction

This white paper is a compilation of information available and provided by the New York State Department of Environmental Conservation (NYSDEC), the New York State Department of Health (NYSDOH) and the New York State Department of Transportation relating to air quality and asthma surrounding the Buffalo Peace Bridge Plaza. The Foreword including key findings was prepared by Sarah Siwek on behalf of the Greater Buffalo Niagara Regional Transportation Council (GBNRTC).

## II. Scope of Paper

The community adjacent to the Peace Bridge plaza has expressed health concerns that it believes are directly related to air quality issues associated with vehicular traffic at the Peace Bridge Plaza. This paper seeks to summarize the facts regarding air quality and asthma as they relate to the Peace Bridge Plaza and the adjacent neighborhoods.

## III. Executive Summary

The intention of this white paper was to compile the information available relating to air quality and asthma surrounding the Buffalo Peace Bridge Plaza. The adjacent community expressed health concerns believed to be directly related to air quality issues associated with the Peace Bridge Plaza.

Asthma is a complex and, unfortunately, common disease. Many environmental, social and genetic factors are known to contribute to the development or exacerbation of asthma, but little is understood about the impact of specific exposures in an individual or a community. The increased asthma hospitalization and Emergency Department (ED) visit rates in the City of Buffalo (including neighborhoods near the Peace Bridge) could be attributed to many factors and are likely the result of multiple factors.

Improvements to the U.S. Plaza will aim to reduce or eliminate vehicle waiting time, idling and backups at customs inspection stations while also accommodating an increase in the number of vehicles using the plaza. These improvements in combination with the continued implementation of the motor vehicle air pollution regulations are expected to result in improved air quality at the U.S. Peace Bridge Plaza and within the surrounding community.

The NYSDEC is partnering with the Buffalo-Fort Erie Public Bridge Authority (PBA) to conduct air monitoring at the Peace Bridge. This monitoring will allow NYSDEC and PBA to assess improvements in air quality for the local community

as a result of any improvements made at the Peace Bridge Plaza and the continued implementation of the motor vehicle air pollution regulations over time.

*Public Health*

Asthma is a serious public health problem. In New York State (NYS), one in every thirteen children and one in every ten adults has asthma. The number of adults in NYS that have asthma increased from 2000 to 2010 and was consistently higher than the national average during this timeframe. During 2010, the number of children aged 0-17 in NYS that have asthma was 7.4% which decreased 27% from 2009 and was the first time that NYS's childhood asthma rate was lower than the national rate of 8.4%.

While there is considerable interest in identifying the factors that cause an individual to develop asthma, little is understood about the impact of specific exposures in an individual or community which can cause or exacerbate asthma. In most cases, it is not possible to determine what environmental, social and genetic factors are contributing to the development or exacerbation of asthma.
The available information compiled indicates that among the four ZIP codes with the highest asthma hospitalization and ED rates, only one ZIP code is near the Peace Bridge, and that area is over a quarter of a mile away and not in the predominant downwind direction from the Peace Bridge. Therefore other environmental, social and genetic factors are contributing to the occurrence of asthma in the local population as reflected by hospitalization and ED visits data. ZIP code data may not be sufficient to draw conclusions about the potential impact of traffic on a neighborhood.

*Air Emissions*

The control of air pollution from motor vehicles is extremely important in order to improve air quality and protect public health. The 1990 Clean Air Act (CAA) empowered the U.S. Environmental Protection Agency (US EPA) to develop regulations that would require the development of fuels that would burn cleaner and would mandate new technology to reduce emissions of criteria air pollutants and hazardous air pollutants from all motor vehicles (cars, trucks and buses). This approach has significantly reduced air pollution from motor vehicles, even as the number of vehicles and vehicle miles traveled has increased over the past twenty-two years.

The US EPA Tier 2 vehicle and gasoline sulfur program was phased in beginning in 2004 and was fully implemented by 2009. This program has made gasoline powered vehicles 77% to 95% cleaner than the 2003 model year. The US EPA heavy-duty engine and vehicle standards and highway diesel fuel sulfur control requirements phase-in commenced with stringent emissions standards for particulate matter in 2007 through 2010. This program results in each new truck and bus being more than 90% cleaner than pre-2007 models. Within 2 years of fully implementing this program, more than half of the trucks crossing at the Peace Bridge Plaza already comply fully with stringent emissions standards for

particulate matter. The US EPA motor vehicle certification and compliance programs will continue to ensure reductions in emission pollution as newer vehicles are designed to meet new emission standards.

Historically, the Buffalo/Niagara region's air quality met all US EPA standards except for ground-level ozone. The ground-level ozone issue is a northeast U.S. regional problem not specific to Western New York. Overall, the concentrations of criteria pollutants (particulate matter, carbon monoxide, sulfur dioxide, nitrogen dioxide) have decreased statewide and more specifically in the Buffalo Metropolitan area. Erie and Niagara counties have been classified as "attainment" under the 2008 ozone standard, effective July 20, 2012. But transportation conformity still applies to both counties (based on the revoked 1997 zone standard) before July 20, 2013.

Ultra fine particles are a class of pollutant that has been the focus of increased research related to health effects, character, fate and environmental measurement. The US EPA has not established air quality standards for measuring ultra fine particles, nor have emissions standards for ultra fine particles been developed for either stationary sources or motor vehicles. Although research efforts are underway in this area, there is currently no means to correctly determine the proper sampling site locations, sampling method, or instrumentation method needed in order to produce an accurate and reliable measure of ultrafine particulates in a near-roadway region. Since there is no universal standard, making comparisons between measurement sites and studies is problematic and potentially misleading.

*Existing Air Monitoring Studies in the area*

There have been two local or micro-scale air quality monitoring studies conducted in near proximity to the Peace Bridge Plaza on the U.S. side of the border. The basic study designs involved the operation of air monitoring sites in tandem with a local meteorological station to measure the incremental impact of motor vehicle emissions from the Peace Bridge and Peace Bridge Plaza on the nearby community known as Buffalo's lower Westside.

The first monitoring study was conducted in 2001 and 2002 by the Buffalo and Fort Erie Public Bridge Authority (BFEPBA) together with the New York State Department of Transportation (NYSDOT) and the Federal Highway Administration (FHWA). The second monitoring study was conducted by The Health Effects Institute (HEI) a highly respected and independent research organization. The HEI study was conducted in 2005 and 2006 and entitled *Air Toxics Exposure from Vehicle Emissions at a U.S. Border Crossing: Buffalo Peace Bridge* and released in 2011.

While both studies monitored particulate matter ($PM_{10}$ and $PM_{2.5}$). The HEI study also collected data for more than one hundred individual chemicals known as air toxics. In comparing the BFEPBA sampled data from 2001-2002 with the HEI data collected in 2005-2006, the average incremental traffic related

contributions from $PM_{10}$ and $PM_{2.5}$ were 47% and 52% lower respectively in 2005-2006 than in 2001-2002. All of the sampling conducted for $PM_{10}$ and $PM_{2.5}$ at any of the monitoring locations for both monitoring studies were below their respective National Air Quality Standards (NAAQS).
While there were sampling time variations (e.g. 24-hour vs. 12-hour) which may account for some of the observed reductions and variation in data, it is also likely related to boarder modification given the time frames in which each study was conducted. Some reduction in traffic occurred after 2001 after the World Trade Center (WTC) attack. This resulted in a significant downturn of traffic traversing the Peace Bridge as well as longer idling times while vehicles waited to get through U.S. customs. Other reductions may have occurred from modification to the U.S. Plaza. Before 2005, all the tollbooths, customs areas, the Peace Bridge Authority Administration Building, and a duty-free shop were located in the Peace Bridge Plaza on the U.S. side of the border, adjacent to west Buffalo neighborhoods. In early 2005 toll collection was relocated to the Canadian side and the tollbooths on the American side were demolished. Passport control and customs inspection remained on the U.S. side. The old duty-free shop was demolished and replaced by a larger one, located at the intersection of two streets on the edge of the Peace Bridge Plaza.

The HEI study provides good information that can serve as a baseline assessment of motor vehicle air toxics in the Westside community. This information can be used to assess air quality improvements that are being predicted to occur as a result of improvements to the traffic flow over the bridge and the regulatory requirements that are gradually being phased in for gasoline and diesel powered vehicles overtime.

*Future Ambient Air Quality*
Vehicles that are stationary on the plaza and idle for extended periods of time due to lack of Customs processing capacity create an “area" source of emissions. These emissions will drift downwind into the areas surrounding plaza. When traffic is kept flowing through the plaza and not permitted to sit idling for any significant length of time, these "area" emission sources do not form, and therefore lessen the opportunity for emissions from the plaza to enter surrounding areas.

Improvements to the U.S. Plaza will aim to reduce or eliminate vehicle idling and backups at customs inspection stations while also accommodating an increase in the number of vehicles using the plaza. Improvements to air quality for the surrounding neighborhood will be achieved through improved traffic flow to reduce congestion and limit idling of vehicles, and significant improvements in diesel fuel and engine technology. Even though traffic is projected to increase over time, the Plazas are designed to keep that traffic moving smoothly by providing the necessary number of inspection lanes. When combined with improvements to diesel fuel and cleaner engine technology air quality is expected to improve surrounding the Peace Bridge Plaza.

## IV. Areas of Concern

This section will summarize the various findings in previous studies focused on three (3) main areas on concern identified in association with the Buffalo Peace Bridge Plaza:

- Air Emissions,
- Public Health,
- Testing & Monitoring.

### *A. Air Emissions*

#### 1. Regulations for the Reduction of Air Pollution

The control of air pollution from motor vehicles is extremely important in order to improve air quality and protect public health. This was recognized by Congress when they amended the 1990 Clean Air Act (CAA) and included provisions to reduce emissions of all air pollutants from motor vehicles. The U.S. Environmental Protection Agency (US EPA) refers to six common pollutants (ozone, particulate matter, carbon monoxide, sulfur dioxide, nitrogen dioxide and lead) as criteria air pollutants. The 1990 CAA empowered the US EPA to develop regulations that would require the development of fuels that would burn cleaner and would mandate new technology to reduce emissions of these criteria air pollutants and hazardous air pollutants from all motor vehicles (cars, trucks and buses). This two-fold approach has significantly reduced air pollution from motor vehicles, even as the number of vehicles and vehicle miles traveled has increased over the past twenty-two years. The control of air pollution from motor vehicles has been an extremely important part of the EPA's and New York State Department of Environmental Conservation's (DEC) strategy to meet the health based national ambient air quality standards and to reduce ambient concentrations of hazardous air pollutants in urban areas. State and Federal air pollution officials are confident that these efforts will result in improved air quality and enhance the public health of all Americans.

There are three general areas of regulatory focus in the national strategy to reduce air pollution from motor vehicles; clean cars and fuels, clean trucks and buses and diesel fuels, and the establishment of certification and

compliance programs.[1] The US EPA developed a Tier 2 program approach which included developing vehicle fuels that would burn cleaner and a gasoline sulfur reduction program which was phased in at the beginning of 2004 and was fully implemented by 2009. This program has made gasoline powered vehicles 77% to 95% cleaner than the 2003 model year. The US EPA heavy-duty engine and vehicle standards and highway diesel fuel sulfur control requirements phase-in commenced with stringent emissions standards for particulate matter in 2007 and were fully implemented to include significant NOx reductions in 2010. This program results in each new truck and bus being more than 90% cleaner than pre-2007 models. Due to the long life of diesel engines it is expected to take until 2030 before all diesel trucks on the road are built subject to the standards, although there are also retro-fit programs available for existing trucks. This regulation will provide annual emission reductions equivalent to removing the pollution from more than 90% of today's trucks and buses. Seventy-five percent (75%) of trucks crossing the Peace Bridge use EZ Pass. EZ Pass tag application data requires stating the age of the vehicle. A July 2012 analysis of EZ Pass transactions, by account, crossing the Peace Bridge indicates that 51.71% of all transactions are 2007 model year or newer. Furthermore, a survey is being conducted at the Peace Bridge Toll Plaza of cash (non-EZ Pass) truck customers. Early indication is that 51.8% of non EZ Pass truck customers are operating 2007 models or newer that are meeting the new US EPA standards. Therefore, within 2 years of fully implementing this program, more than half of the trucks crossing at the Peace Bridge Plaza already comply fully with stringent emissions standards for particulate matter, and that fraction is increasing standards, indicating a nearly 50% reduction in emission pollution compared to pre-2007 levels. As fleet turn over continues, the number of diesel trucks built to US EPA standards crossing the Peace Bridge will continue to increase and additional reductions in emission pollution is expected. The US EPA motor vehicle certification and compliance programs will ensure that all vehicles are designed to meet new emission standards and they will continue to meet those standards throughout their useful life.

All of these motor vehicle air pollution regulations were specifically developed to improve air quality in urban areas that are heavily impacted by motor vehicles. These regulations, in tandem with the overall vehicle congestion relief that have been realized by previous Peace Bridge plaza improvements (ie. relocation of tolls out of U.S.; relocation of Duty Free to edge of U.S. Plaza; redesign and reconstruction of Canadian Plaza) and that will be further improved with upgrades of the U.S. Peace Bridge

[1]United States Environmental Protection Agency (US EPA). 2005. Toward a Cleaner Future: Office of Transportation and Air Quality Progress Report 2005. Available On-Line: http://www.epa.gov/otaq/about/420r05011.pdf

Plaza, are expected to result in improved overall air quality in the local community.

## 2. Air Quality Trends in New York

The DEC has an extensive ambient air quality surveillance network across New York State that is used to assess the regulatory progress as various federal and state air pollution control strategies are implemented over time and to provide the public with information on air quality. The data from this network is also used by researchers to study the public health impacts of air pollution. Figures 1 – 6 provide an overview of improving air quality over time as the regulations to control air pollution from motor vehicles and other sources are implemented.[2] Overall, the concentrations of criteria pollutants (particulate matter, carbon monoxide, sulfur dioxide, nitrogen dioxide) have decreased statewide and more specifically in the Buffalo Metropolitan area. The Buffalo/Niagara Region is currently in attainment with the national ambient air quality standards for all of these air pollutants.

[2] New York State Department of Environmental Conservation. 2010. NYS Ambient Air Monitoring Program Assessment (May 2010). Available On-Line: http://www.dec.ny.gov/chemical/65574.html

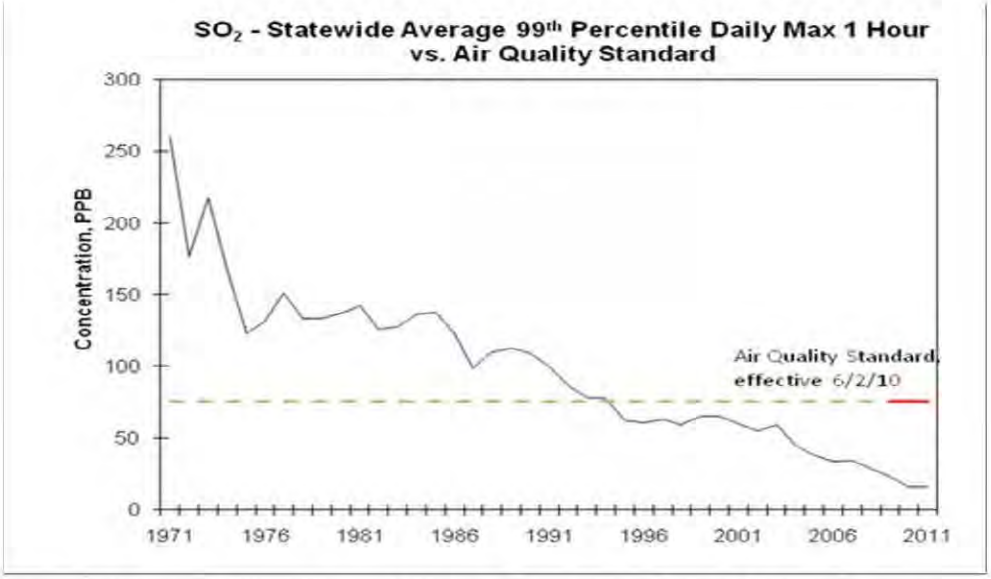


Figure 1. Statewide Sulfur Dioxide Trend Over Time

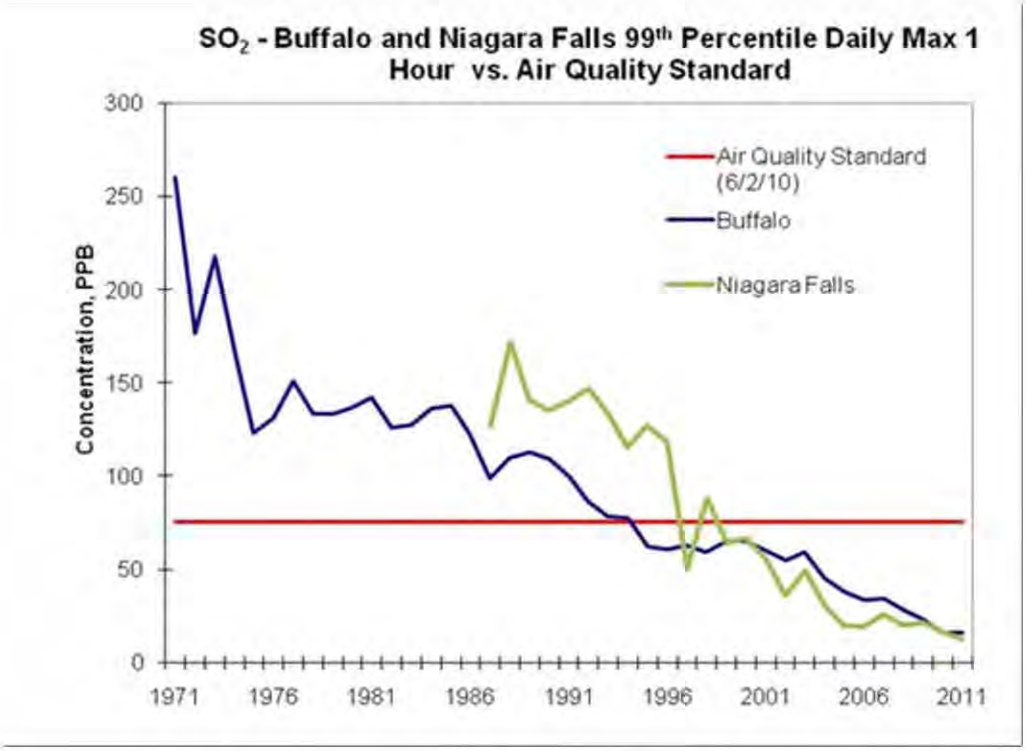


Figure 2. Buffalo/Niagara Falls Sulfur Dioxide Trends Over Time

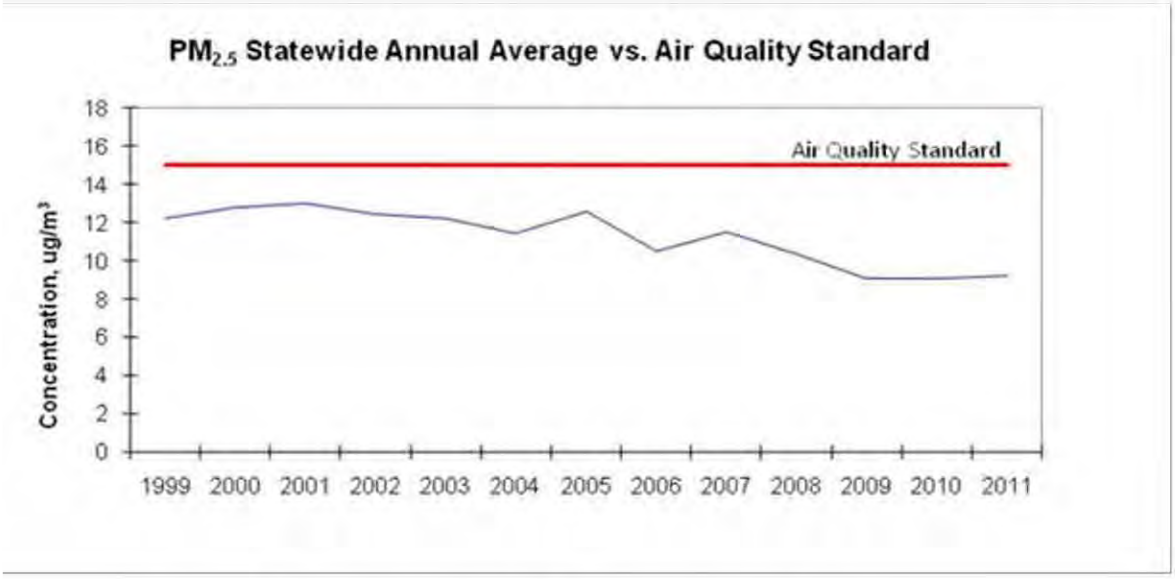


Figure 3. Statewide $PM_{2.5}$ Trend Over Time.

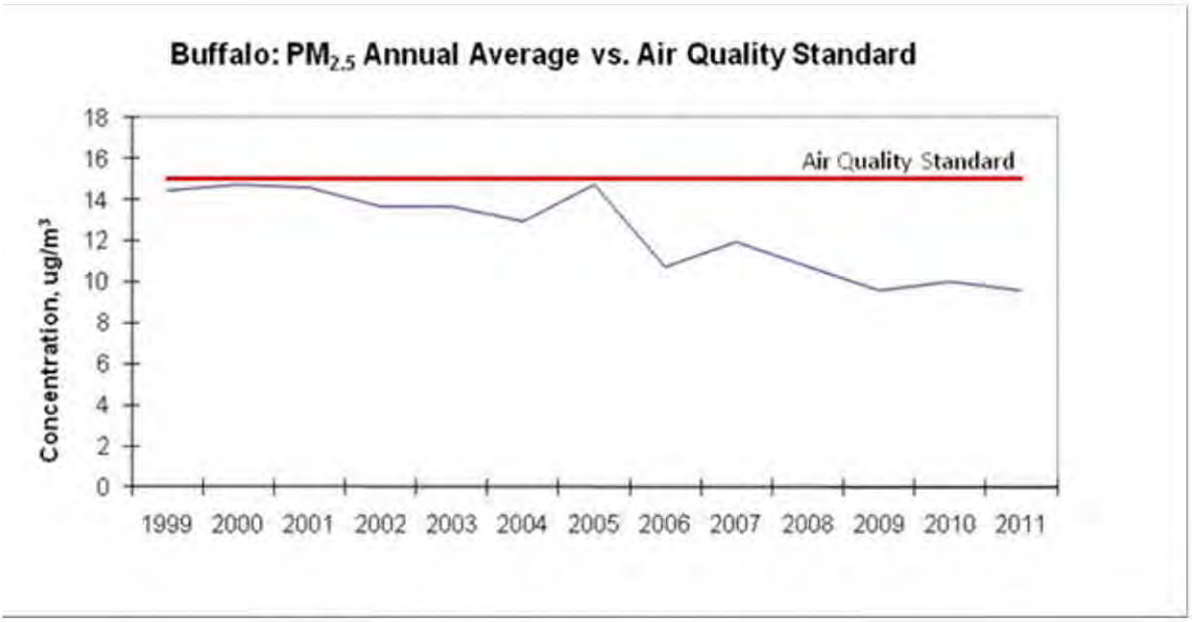


Figure 4. Buffalo $PM_{2.5}$ Trends Over Time

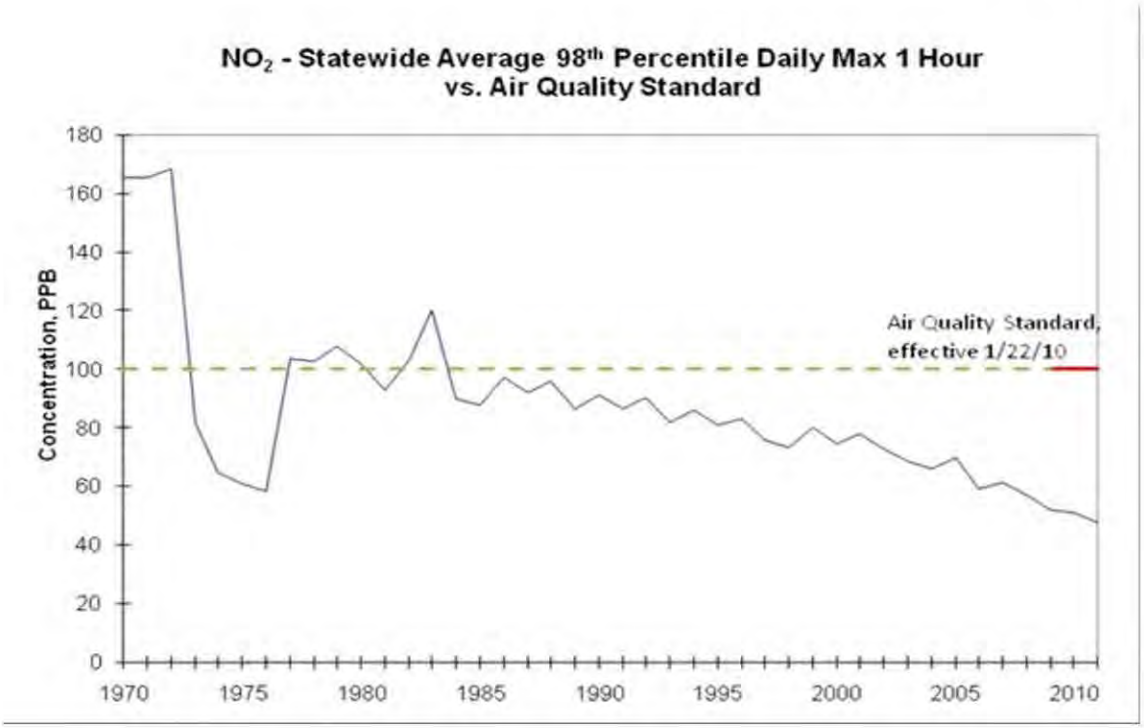


Figure 5. Statewide Nitrogen Dioxide Trend Over Time

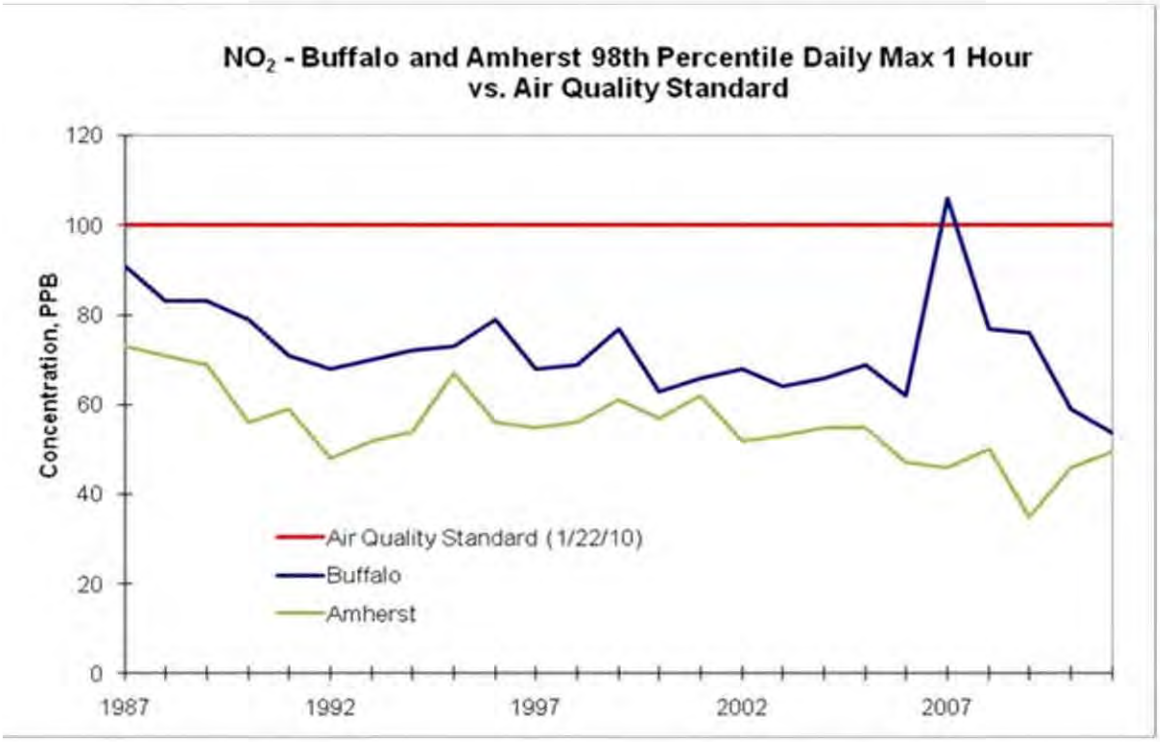


Figure 6. Buffalo/Amherst Nitrogen Dioxide Trends Over Time

The concentrations of benzene, a motor vehicle air toxic of concern, have also been decreasing over time as the new regulations developed to reduce motor vehicle air toxics are being phased in over time. While significant reductions in benzene have occurred, it remains an important air toxics issue, as it appears at levels which exceed the Annual Guideline Concentration (AGC) virtually everywhere across the state (Figure 9).

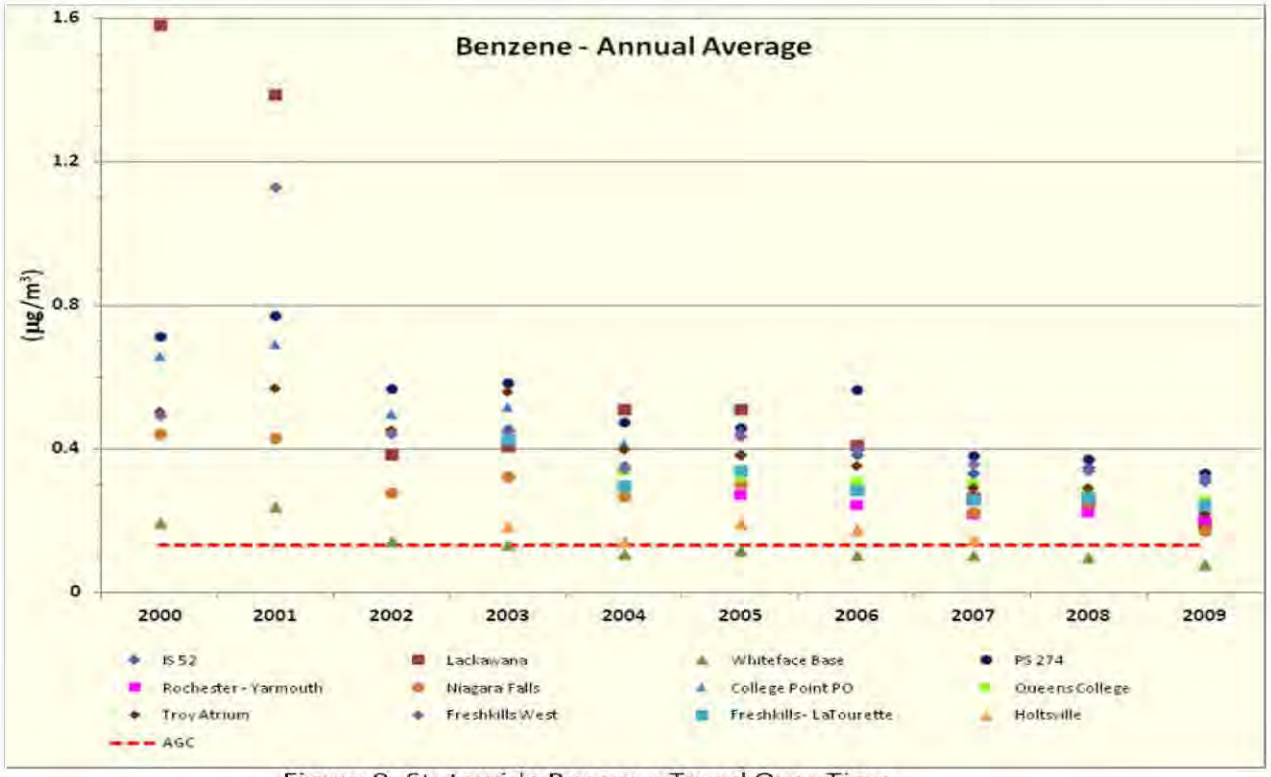


Figure 9. Statewide Benzene Trend Over Time

### 3. Ultra Fine Particles

Ultra fine particles are a class of pollutant that has been the focus of increased research related to health effects, character, fate and environmental measurement. These particles, typically less than 100 nanometers in size, result from all combustion processes, including combustion in the internal combustion engines of cars and trucks. The US EPA has not established air quality standards for ultra fine particles, nor have emissions standards for ultra fine particles been developed for either stationary sources or motor vehicles.

Ultrafine particles from pre-2007 diesel engines generally comprise primarily black carbon (BC), organic carbon (OC), metals, and sulfates. To meet stringent particulate matter (PM) standards, virtually all new on-highway diesel trucks in the United States, beginning with the 2007 model year, have been equipped with diesel particulate filters (DPF). DPFs preferentially reduce BC, OC, and metals. DPFs typically eliminate more

than 90% of diesel PM and can reduce black carbon (BC) by as much as 99%. The type of DPFs typically used on new model year vehicles are called "wall flow" filters with a catalyst coated on a ceramic monolith with the exhaust flowing through the filter walls trapping the PM and allowing the exhaust gases to flow through. The trapped PM is then oxidized by reaction with compounds such as oxygen and nitrogen dioxide on the catalyst surface. This technology preferentially removes solid particles. Also, the use of ultra low sulfur diesel fuel reduces total sulfate emissions (and emissions of ultrafine sulfate PM). Recent work shows that DPFs reduce particle number (an indicator of ultrafines or nanoparticles) by up to 90-99% based on emissions characterization with four 2007 heavy duty diesel engines. See 2012 EPA report. http://www.epa.gov/blackcarbon/

Atmospheric monitoring for ultra fine particles is an evolving area of study. There are no universally accepted methods for measuring ultra fines, and the methods that currently exist are not uniform between different studies and measurement sites, making inter-comparison of the results problematic and potentially misleading. In addition, research into how to properly measure ultra fine particulate concentration near roadways is still only in the early stages. Factors such as distance from the roadway, the impact of vegetation and man-made structures, vertical concentration profiles, etc. are poorly understood at this time. Although research efforts are underway in this area, there is currently no scientific protocol or standards to correctly determine the proper sampling site locations, sampling method, or instrumentation method needed in order to produce an accurate and reliable measure of ultra fine particulates in a near-roadway region.

## 4. Conformity with US EPA Standards

Three air quality pollutants can be directly related to vehicular traffic, ozone, particulate matter (PM) and carbon monoxide (CO). The Buffalo/ Niagara region is in attainment for these three air quality pollutants and meets all US EPA air quality standards. Historically, the Buffalo/Niagara region's air quality met all US EPA standards except for ground-level ozone. The ground-level ozone issue is a northeast U.S. regional problem not specific to Western New York. The northeastern states have established emission control programs to reduce the emission of the pollutants that form ground-level ozone; these control programs control smokestack sources as well as limiting emissions from vehicle fuels, controls at the gas station to prevent gasoline vapors from escaping while vehicles are refueled and stricter emission controls for vehicles sold in the northeast.

On a local level, vehicle movements directly affected PM and CO pollutant levels. Particulate matter, specifically $PM_{2.5}$, (particulate matter equal to or less than 2.5 microns in size), is a pollutant that can impact public health (i.e., affect asthma and breathing related problems). Governmental regional air quality monitors indicate that the Peace Bridge air quality for PM is better than the existing US EPA health-based ambient air quality standards. Carbon monoxide (CO) is a common air pollutant produced by vehicle engines and is most often tied to air quality concerns at or near roadway intersections or anywhere vehicles stop and start. Regional levels of CO are notably below US EPA health-based ambient air quality standards.

The US EPA establishes ambient air quality standards through comprehensive scientific study to "...protect public health, including the health of "sensitive" populations such as asthmatics, children, and the elderly." http://www.epa.gov/air/criteria.html

## *B. Public Health*

Asthma is a serious public health problem. In New York State (NYS), one in every thirteen children and one in every ten adults has asthma[3,4]. Current asthma prevalence (how many people have asthma) among adults in NYS increased from 7.7% in 2000 to 9.8% in 2010 and was consistently higher than the national average during this timeframe[4]. During 2010, the annual current asthma prevalence for children aged 0-17 in NYS was 7.4% [3] (a decrease of 27% from 2009 and the first time that NYS's childhood asthma rate was lower than the national rate of 8.4%).

Some areas of the state are more affected by asthma. The New York State Department of Health's public website has information about asthma prevalence in NYS, and asthma-related Emergency Department (ED) visits and asthma-related hospitalizations at the county and ZIP code level. This information is available at:
www.health.ny.gov/statistics/ny_asthma/index.htm.

### 1. Asthma Causes and Risk Factors

There is considerable interest in identifying the factors that cause an individual to develop asthma, but there is no definitive answer to this

[3] *CDC - Asthma - BRFSS 2010 - Child Asthma Data - Table C1 Child Current Asthma Prevalence Rate (Percent) and Prevalence (Number) by State or Territory: BRFSS 2010*. Centers for Disease Control and Prevention. Available at: http://www.cdc.gov/asthma/brfss/2010/child/current/tableC1.htm. Accessed June 7, 2012.

[4] *CDC - Asthma - BRFSS 2010 - Table C1 Adult Self-Reported Current Asthma Prevalence Rate (Percent) and Prevalence (Number) by State or Territory*. Centers for Disease Control and Prevention. Available at: http://www.cdc.gov/asthma/brfss/2010/current/tableC1.htm. Accessed June 7, 2012.

question and in most cases it is not possible to determine what causes a specific individual to develop asthma[5]. Evidence suggests that the development (or onset) of asthma is a complex process that may involve both genetic factors and environmental exposures (including allergens, pollution, infections and stress)[5]. Much more is known about the factors that exacerbate asthma for people with existing asthma. Anything that makes existing asthma worse is called an asthma trigger. Important triggers include colds, flu and viruses, exercise, stress, wood smoke, mold, animal dander (e.g., from furry pets), outdoor air pollution (e.g., ozone, particulate matter, sulfur dioxide), tobacco smoke and allergens produced by dust mites, cockroaches and rodents[6].

***Disparities***

Although the causes of asthma are poorly understood, there are significant racial, ethnic and socioeconomic disparities in the prevalence of asthma and in asthma outcomes. According to the *Coordinated Federal Action Plan to Reduce Racial and Ethnic Asthma Disparities*[7]:

- 12.2% of children with a family income less than 100 % of the federal poverty level have asthma – compared to 9.9 % of children with a family income up to 200 % of the federal poverty level, and 8.2 % of children with a family income greater than 200 % of the federal poverty level.
- The prevalence of current asthma in the U.S. is 16 % among non-Hispanic black children; 10.7 % among American Indian and Alaska Native children; 6.8 % among Asian; 8.2 % among non-Hispanic white; and 7.9 % among Hispanic children (16.5 % among Puerto Rican children and 7 % among Mexican children)[7].
- Among children with asthma, black children are twice as likely to be hospitalized, more than twice as likely to have an emergency room visit and are four times more likely to die due to asthma than white children[7].
- Minority children are less likely than white children to be prescribed or take recommended treatments to control their asthma and are less likely to attend outpatient appointments[7].

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[5] *Expert Panel Report 3: Guidelines for the Diagnosis and Management of Asthma (EPR 2007)*. Bethesda, MD: U.S. Department of Health and Human Services; National Institutes of Health; National Heart, Lung, and Blood Institute; National Asthma Education and Prevention Program; 2007. Available at: www.nhlbi.nih.gov/guidelines/asthma.

[6] *CDC - Asthma - Important Asthma Triggers.* Centers for Disease Control and Prevention. Available at: http://www.cdc.gov/asthma/triggers.html. Accessed June 7, 2012.

[7] US EPA. *Children's Health Presidential Taskforce: Asthma Disparities Report*. United States Environmental Protection Agency. Available at: http://www.epa.gov/childrenstaskforce/. Accessed June 7, 2012.

***Air Quality and Emissions***

Since asthma is a respiratory disease, indoor and outdoor air quality are of particular interest to any discussion about factors that contribute to the development and exacerbation of asthma. Environmental tobacco smoke, animal dander, allergens produced by dust mites, allergens produced by rodents and cockroaches, cleaning chemicals, pollen, mold, ozone, sulfur dioxide, and particulate matter are all constituents of indoor and outdoor air that are important for asthma. For people with existing asthma, exposure to any of these can trigger allergic reactions or cause respiratory irritation that exacerbates symptoms. Exposure to some pollutants – such as dust mite and cockroach allergens, environmental tobacco smoke, ozone and fine particles – have also been associated, in some studies, with the development, or onset, of asthma[8,9,10,11,12,13,14,15,16].

Many asthma triggers vary with season, geography and other factors. Outdoor pollutants, including ozone, sulfur dioxide and fine particles, vary seasonally or with changes in meteorological conditions such as temperature.

> ***"Ozone***, the principal component of smog, is produced by the reaction of sunlight with air contaminants from automobile exhausts, other combustion sources and industrial emissions. Ozone levels are most likely to be elevated on hot, sunny afternoons. In the northeastern U.S., summer ozone pollution has been associated with 10-20% of summertime respiratory hospital visits and admissions. In U.S. and Canadian studies, the ozone-associated increase in daily respiratory hospital admissions ranged from 2-30% with daily ozone

[8] *Clearing the Air: Asthma and Indoor Air Exposures* - Institute of Medicine. Available at: http://iom.edu/Reports/2000/Clearing-the-Air-Asthma-and-Indoor-Air-Exposures.aspx. Accessed April 24, 2012.

[9] *Climate Change, the Indoor Environment, and Health - Institute of Medicine.* Available at: http://www.iom.edu/Reports/2011/Climate-Change-the-Indoor-Environment-and-Health.aspx. Accessed April 25, 2012.

[10] Chen Y-C, Tsai C-H, Lee YL. Early-life indoor environmental exposures increase the risk of childhood asthma. *International Journal of Hygiene and Environmental Health*. 2011;215(1):19–25.

[11] Zeldin DC, Eggleston P, Chapman M, et al. How Exposures to Biologics Influence the Induction and Incidence of Asthma. *Environ Health Perspect*. 2006;114(4):620–626.

[12] King ME, Mannino DM, Holguin F. Risk factors for asthma incidence. A review of recent prospective evidence. *Panminerva medica*. 46(2):97.

[13] Gilmour MI, Jaakkola MS, London SJ, Nel AE, Rogers CA. How exposure to environmental tobacco smoke, outdoor air pollutants, and increased pollen burdens influences the incidence of asthma. *Environ. Health Perspect.* 2006;114(4):627–633.

[14] Gehring U, Wijga AH, Brauer M, et al. Traffic-related Air Pollution and the Development of Asthma and Allergies during the First 8 Years of Life. *American Journal of Respiratory and Critical Care Medicine*. 2010;181(6):596–603.

[15] Clark NA, Demers PA, Karr CJ, et al. Effect of early life exposure to air pollution on development of childhood asthma. *Environ. Health Perspect.* 2010;118(2):284–290.

[16] Arshad SH. Does Exposure to Indoor Allergens Contribute to the Development of Asthma and Allergy? *Current Allergy and Asthma Reports*. 2009;10(1):49–55.

increments in the warm season that ranged from 20-40 parts per billion (ppb) for different ozone averaging times."[17]

***Particulate Matter*** *(also known as particle pollution or PM)* is a mixture of solid particles or liquid droplets in the air. Outdoor sources of PM are primarily from activities involving combustion (e.g., motor vehicle exhaust, power plant emissions and wildfires). PM also forms from the reaction of gases in the atmosphere. Indoor sources are also related to burning (e.g., tobacco smoke, cooking, fireplaces, woodstoves, incense, and candles). The United States Environmental Protection Agency (US EPA) has established outdoor air standards for particulates in two size ranges, called fine (PM2.5) and coarse (PM 10) particulates[18]. The association between ambient air particulate matter (PM) concentrations and asthma, including increased hospital admissions, is well documented[18]. EPA analysis of the combined results from multiple PM health studies suggests that a 10 μg/m3 (micrograms per cubic meter of air) daily increase in fine particles in outdoor air is associated with a 1-10% increase in daily asthma-related hospital admissions visits[18]. Currently, the potential health effects of ultra fine particles (UFPs), or specifically, mobile source related UFPs are not well understood. However, there is some research that looks at the potential contribution of diesel exhaust particulates (DEP) to the PM-related health effects observed in epidemiological studies. DEPs vary in size from less than 0.1 micrometer (ultra fine particulate) to more than 1 micrometer (fine particulate). Most of the particulates in diesel exhaust are present in the UFP size fraction. At this time, the number of studies looking at human exposures to ultrafine DEPs or other UFPs in laboratory, occupational, or community settings is limited, and although some studies have raised concerns about health effects from exposure to UFPs, in 2011, the US EPA concluded that current collective evidence "is suggestive of a causal relationship between short-term exposures to UFPs and cardiovascular and respiratory effects," but is too limited to support a UFP standard[19].

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[17] Public Health Information Group, New York State Department of Health. New York Asthma Surveillance Summary Report. October 2009. Available at: www.health.ny.gov/statistics/ny_asthma/pdf/2009_asthma_surveillance_summary_report.pdf. Accessed June 25, 2012.

[18] US EPA National Center for Environmental Assessment RTPN, Stanek L. Integrated Science Assessment for Particulate Matter (Final Report). Available at: http://cfpub.epa.gov/ncea/isa/recordisplay.cfm?deid=216546. Accessed June 7, 2012.

[19] Policy Assessment for the Review of the Particulate Matter National Ambient Air Quality Standards. US EPA. Available at: http://www.epa.gov/ttn/naaqs/standards/pm/data/20110419pmpafinal.pdf. Accessed June 7, 2012.

***Sulfur dioxide ($SO_2$)*** gas is highly reactive. Most of the ambient $SO_2$ is produced from fossil fuel combustion at power plants (73%) and other industrial facilities (20%)[20]. Sulfur-containing fuels that are used by off- road mobile sources (e.g., locomotives, ships and other equipment) are another significant $SO_2$ source. Vehicles using gasoline and other low sulfur fuels are not a significant source of $SO_2$ emissions. Scientific studies link exposures to $SO_2$, ranging from 5 minutes to 24 hours, with adverse respiratory effects including bronchoconstriction and increased asthma symptoms[21]. These effects are observed in people with asthma, who are engaged in vigorous activities, like exercising or playing. Some epidemiologic studies show short-term increases in ambient $SO_2$ air levels are associated with more respiratory illness in children, the elderly, and people with asthma that result in emergency department visits and hospitalizations[21]. In addition to the direct effects of $SO_2$ on respiratory health, $SO_2$ emissions can also react in the atmosphere to form sulfate, contributing to fine particulate matter concentrations in ambient air[21].

***Pollen*** can also be a trigger for many people with asthma. Pollen is produced by plants. The type and amount of pollen in the air will vary with location, the types of plants nearby, weather, and season. Some plants (e.g., trees, grasses and weeds) produce pollen at different times of the year. Pollen from some grass, tree and weed species is spread from plant to plant by the wind, adding it to the air pollutants in outdoor air. If people with asthma are allergic (or sensitized) to pollen from trees, grasses or weeds their asthma can be aggravated by pollen in the air. Some studies show that when pollen levels rise, people use more asthma medication and make more Emergency Department (ED) visits for asthma related illness [22,23,24,25,26,27]. Some studies indicate that when both PM and pollen

[20] US EPA. Sulfur Dioxide. Air & Radiation. US EPA. Available at: http://www.epa.gov/air/sulfurdioxide/. Accessed June 7, 2012.
[21] US EPA National Center for Environmental Assessment RTPN, Johns D. Integrated Science Assessment (ISA) for Sulfur Oxides – Health Criteria (Final Report). Available at: http://cfpub.epa.gov/ncea/isa/recordisplay.cfm?deid=198843. Accessed June 7, 2012.
[22] Sheffield PE, Weinberger KR, Ito K, et al. The Association of Tree Pollen Concentration Peaks and Allergy Medication Sales in New York City: 2003–2008. *ISRN Allergy*. 2011;2011:1–7.
[23] DellaValle CT, Triche EW, Leaderer BP, Bell ML. Effects of Ambient Pollen Concentrations on Frequency and Severity of Asthma Symptoms Among Asthmatic Children. *Epidemiology*. 2012;23(1):55–63.
[24] Cakmak S, Dales RE, Coates F. Does air pollution increase the effect of aeroallergens on hospitalization for asthma? *Journal of Allergy and Clinical Immunology*. 2012;129(1):228–231.
[25] Zhong W, Levin L, Reponen T, et al. Analysis of short-term influences of ambient aeroallergens on pediatric asthma hospital visits. *Science of The Total Environment*. 2006;370(2–3):330–336.
[26] May L, Carim M, Yadav K. Adult asthma exacerbations and environmental triggers: a retrospective review of ED visits using an electronic medical record. *The American Journal of Emergency Medicine*. 2011;29(9):1074–1082.

levels are higher in outdoor air the number of pollen-related ED visits increase. This suggests that more people may experience asthma symptoms when PM and pollen are present together in outdoor air [24, 27].

***Exposure to traffic***

As noted above, motor vehicle exhaust may contribute to the production of ozone and particulate matter, both of which are important asthma triggers for some people with asthma. There is also more limited evidence about the contribution of these outdoor pollutants to the development of asthma in some individuals. Multiple studies focused on potential health effects associated with residential proximity to roadways have found associations between exposure to traffic and respiratory outcomes [28,29,30]. However, since most people are typically exposed to a wide range of asthma triggers (including colds/flu, stress, dust mites, pollen and others), the relative contribution of traffic in the development or exacerbation of asthma within a particular individual or community is uncertain.

## 2. Maps of Asthma Hospitalization and Emergency Department Data and Associated Risk Factors

The maps in Figures 1 and 2 provide information about asthma hospitalization and Emergency Department (ED) visit rates by ZIP code, for the years 2007-2009[31]. The maps also provide information about many

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[27] Lierl MB, Hornung RW. Relationship of outdoor air quality to pediatric asthma exacerbations. *Annals of Allergy, Asthma & Immunology*. 2003;90(1):28–33.

[28] Boothe VL, Shendell DG. Potential health effects associated with residential proximity to freeways and primary roads: review of scientific literature, 1999-2006. *J Environ Health*. 2008;70(8):33–41, 55–56.

[29] Salam MT, Islam T, Gilliland FD. Recent evidence for adverse effects of residential proximity to traffic sources on asthma. *Curr Opin Pulm Med*. 2008;14(1):3–8.

[30] Lin S, Munsie JP, Hwang S-A, Fitzgerald E, Cayo MR. Childhood Asthma Hospitalization and Residential Exposure to State Route Traffic. *Environmental Research*. 2002;88(2):73–81.

[31] **Technical notes for Figures 1 and 2.**

*Asthma hospitalizations:* www.health.ny.gov/statistics/ny_asthma/hosp/zipcode/erie__t6.htm

Hospital discharge data from Statewide Planning and Research Cooperative System (SPARCS) were used to create ZIP code specific asthma hospital discharge rates. Asthma hospital discharges were selected if the principal diagnosis was asthma (ICD-9-CM code of 493). Asthma hospital discharges are based on the patient's county of residence.

*Asthma Emergency Department (ED) visits:*
www.health.ny.gov/statistics/ny_asthma/ed/zipcode/erie__t6.htm

Asthma Emergency Department (ED) data are generated from two databases within the SPARCS: the (1) Hospital Inpatient database and (2) Outpatient database were used to create asthma ED visit data. The SPARCS Hospital Inpatient database collects records for patients who are admitted to the hospital directly from the ED and for those who are hospitalized without first utilizing the ED. The SPARCS Hospital Outpatient database contains information on ED visits for individuals who visit the ED but are not hospitalized.

Population estimates used for computing the county and state level hospital discharge and emergency department visits rates were obtained by the NYSDOH Bureau of Biometrics from the U.S. Census Bureau.

of the risk factors described above[32], including race, ethnicity, income level and traffic volume along I-190 and I-90.

*What the maps show*

There are geographic variations in asthma hospital admission rates, asthma-related Emergency Department (ED) visits and associated risk factors in the City of Buffalo, but no clear pattern of association with high-traffic areas along routes I-190 or I-90. Consistent with racial, ethnic and income disparities seen nationally, areas with higher rates of asthma hospitalization and ED visits also tended to have higher levels of poverty and a greater proportion of African-American and/or Hispanic residents.

- The four ZIP code areas with the highest asthma admission rates include 14201, 14203, 14204, and 14215, which are also located in areas with high levels of poverty (20% and greater).
- The three ZIP code areas with the highest rates of asthma-related ED visits are 14201, 14203 and 14211, which are also among areas with high levels of poverty (20% and greater).
- Approximately 13.5% of the population in Erie County is African-American and 4.5% is Hispanic. In the City of Buffalo, ZIP code areas with a higher proportion of African-American (20% or greater) or Hispanic (7% or greater) residents also have higher rates of asthma hospitalizations and ED visits. This includes ZIP codes in the vicinity of the Peace Bridge (e.g., 14213, 14201, 14202) but also ZIP code areas that are not near the Peace Bridge (e.g., 14203, 14204, 14211, 14215)
- Among the four ZIP codes with the highest asthma hospitalization rates, only ZIP code 14201 is near the Peace Bridge, however, it is over a quarter of a mile away and is not in the predominant downwind direction from the Peace Bridge.

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Population estimates by ZIP code used for computing the hospital discharge and emergency department visits rates were obtained by the New York State Department of Health (NYSDOH) from Claritas Corporation.

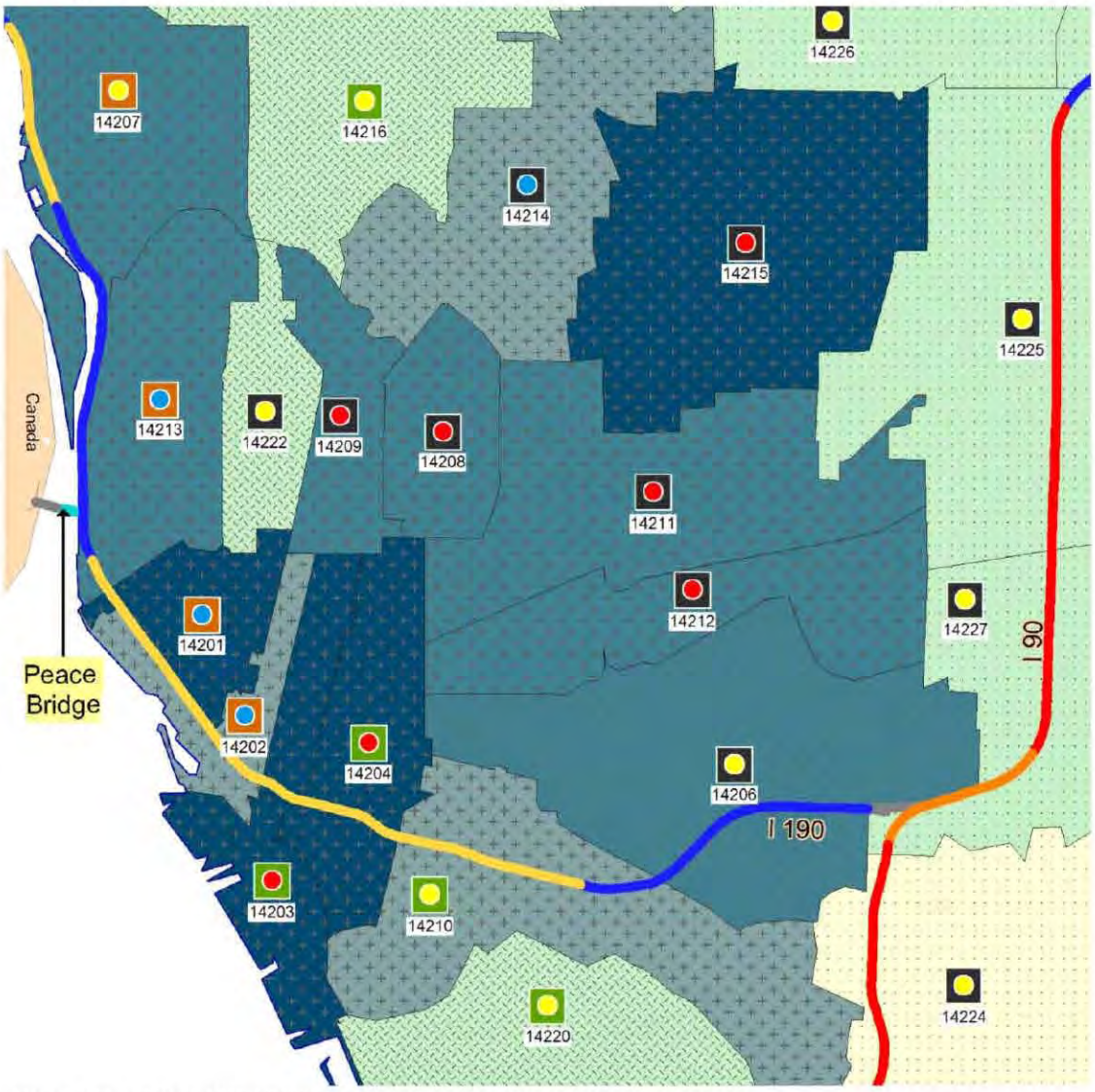
[32] **Technical notes for Figures 1 and 2**

*Population below poverty:* http://nysparks.com/grants/documents/PovertyTablebyZipCode.pdf
*Population by race and ethnicity:* http://biometrics/vspop.asp and
http://biometrics/pops/website/claritas/claritaspop.doc (data and data release information)
*Annual average daily traffic* (AADT) is an estimated average daily traffic volume on a route segment at a particular count station location. Actual daily volumes encountered on highways may vary from the AADT. Considerably higher or lower values often result in areas of seasonal activities and when comparing weekend versus weekday traffic. Federal Highway Administration (FHWA) guidelines published in the Traffic Monitoring Guide indicate that the expansion of 'short' counts to AADT with properly designed adjustment factors will enable the user to be 95% confident that the estimated AADT is within +/-10% of the actual value. www.dot.ny.gov/divisions/engineering/technical-services/highway-data-services/hdsb
(source:https://www.dot.ny.gov/divisions/engineering/applications/traffic-data-viewer/tdv-definitions)
*Truncated equal intervals:* Cut points for each of the categories displayed on the map were determined using the truncated equal interval method. This method divides the value ranges in each category equal in size, except the very high (outlier) value. The truncated range of data values is divided equally into however many categories have been chosen. The highest value is added to the top category.

- ZIP code 14215 is among the areas with the highest rates of asthma hospitalizations. This area also has a higher level of poverty and a higher proportion of African-American residents, but is farther away from I-90, I-190 and the Peace Bridge.
- As illustrated in the maps, annual daily traffic counts (2008), are lower in the immediate vicinity of the Peace Bridge compared to other segments of I-190 and I-90 and do not show a clear association with areas of the City most affected by high rates of asthma hospitalizations or Emergency Department (ED) visits. However, exposure to air pollution from traffic emissions may be localized (e.g., within 200-300 meters (656-984 feet) of the roadway[30]) so asthma hospitalization and ED visit data at the ZIP code level may not be sufficient to draw conclusions about the potential impact of traffic on a neighborhood. There are also many other factors that could influence potential exposure, including the nature of traffic along roadways (continuous flow vs. stop and go), wind patterns and terrain.
- ZIP code 14215 is among the areas with the highest rates of asthma hospitalizations. This area also has a higher level of poverty and a higher proportion of African-American residents, but is farther away from I-90, I-190 and the Peace Bridge.

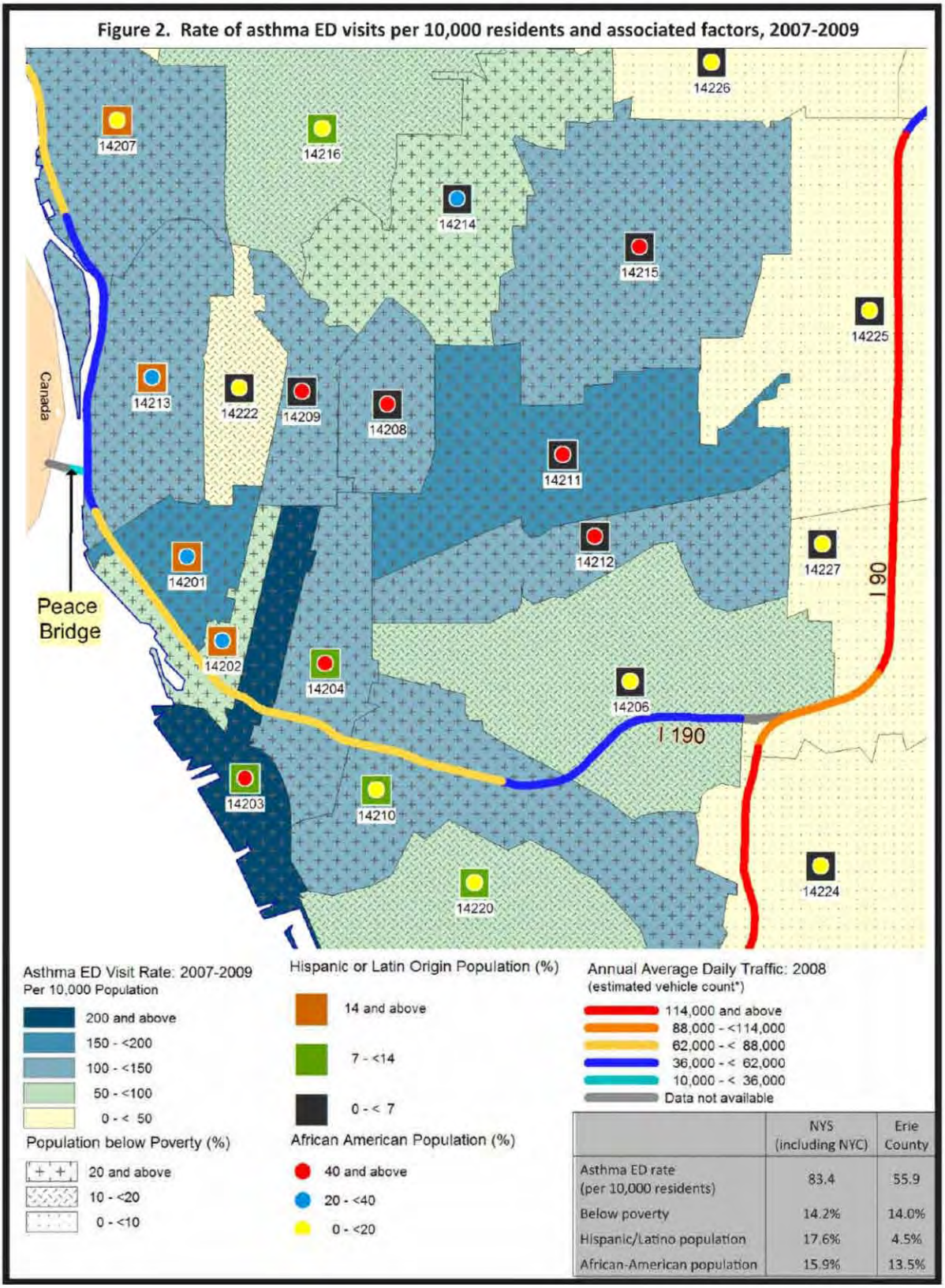
As illustrated in the maps, annual daily traffic counts (2008), are lower in the immediate vicinity of the Peace Bridge compared to other segments of I-190 and I-90 and do not show a clear association with areas of the City most affected by high rates of asthma hospitalizations or Emergency Department (ED) visits. However, exposure to traffic may be localized (e.g., within 200-300 meters (656-984feet) of the roadway[30]) so asthma hospitalization and ED visit data at the ZIP code level may not be sufficient to draw conclusions about the potential impact of traffic on a neighborhood. There are also many other factors that could influence potential exposure, including the nature of traffic along roadways (continuous flow vs. stop and go), wind patterns and terrain.

**Figure 1. Rate of asthma hospitalizations per 10,000 residents and associated factors, 2007-2009**




| | NYS (including NYC) | Erie County |
|---|---|---|
| Asthma hospitalization rate (per 10,000 residents) | 20.3 | 13.2 |
| Below poverty | 14.2% | 14.0% |
| Hispanic/Latino population | 17.6% | 4.5% |
| African-American population | 15.9% | 13.5% |

**Figure 2. Rate of asthma ED visits per 10,000 residents and associated factors, 2007-2009**




| | NYS (including NYC) | Erie County |
|---|---|---|
| Asthma ED rate (per 10,000 residents) | 83.4 | 55.9 |
| Below poverty | 14.2% | 14.0% |
| Hispanic/Latino population | 17.6% | 4.5% |
| African-American population | 15.9% | 13.5% |

### 3. Public Health Summary

Asthma is a complex and, unfortunately, common disease. Many environmental, social and genetic factors are known to contribute to the development or exacerbation of asthma, but little is understood about the impact of specific exposures in an individual or a community. The increased asthma hospitalization and ED visit rates in the City of Buffalo (including neighborhoods near the Peace Bridge) could be due to many factors and are likely the result of multiple factors. These risk factors include socioeconomic characteristics, exposure to multiple outdoor air toxics from other local emission sources, traffic proximity, access to medical care and disease severity among individuals living in the neighborhood. Other risk factors such as family history of asthma, poor indoor environment, smoking, and stress may also have contributed to the high asthma rates in this area.

Although there is no cure for asthma, asthma attacks can be prevented and controlled with proper care[33]. New York is actively working with health care providers, community coalitions, schools, families and many others to fight asthma so people with asthma can live a full and active life. For more information about New York's Action against asthma: www.health.ny.gov/diseases/asthma/ny_action.htm.

## C. *Air Quality Monitoring Studies in the Peace Bridge Area*

There have been two local or micro-scale air quality monitoring studies conducted in near proximity to the Peace Bridge Plaza on the U.S. side of the border. The basic study designs involved the operation of air monitoring sites in tandem with a local meteorological station to measure the incremental impact of motor vehicle emissions from the Peace Bridge and Peace Bridge Plaza on the nearby community known as Buffalo's lower Westside. This was accomplished by knowing the average or exact daily traffic counts crossing the bridge on the sampling days, which included an assessment of the hourly percentage of diesel trucks and gasoline powered vehicles in one of the studies.

The Buffalo and Fort Erie Public Bridge Authority (BFEPBA) together with the New York State Department of Transportation (NYSDOT) and the Federal Highway Administration (FHWA) commissioned short-term air quality monitoring studies in 2001 and 2002 for inclusion into the September 2007 draft environmental impact statement (DEIS) for the

[33] New York State Department of Health. Asthma Information. Available at: www.health.ny.gov/diseases/asthma/. Accessed June 25, 2012.

bridge expansion project.[34] The study was limited to monitoring particulate matter ($PM_{10}$ and $PM_{2.5}$) for 24 hours and conducting an elemental analysis of the PM filters to assess concentrations of metals, elemental carbon, organic carbon and elemental sulfur to determine the origin of the sources. These sampling campaigns were of a relatively short duration (14 to 16 days). The $PM_{10}$ measurements indicated there was a slight increase that was attributed to motor vehicle emissions from the U.S. Plaza. The $PM_{10}$ sampling event was disrupted by the September 11, 2001 World Trade Center (WTC) attack which resulted in a significant downturn of traffic traversing the bridge, but resulted in some very interesting observations. The $PM_{10}$ sampling prior to the WTC event indicated that the average incremental $PM_{10}$ impact from the U.S. Plaza on the lower Westside community was 2.2 $ug/m^3$. The $PM_{10}$ sampling during the post WTC event indicated the average incremental $PM_{10}$ impact from the U.S. Plaza on the lower Westside community was 8.8$ug/m^3$. The investigators attributed the large increase in the average incremental $PM_{10}$ contribution from the U.S. Plaza was due to the long traffic back-ups, even though the average daily traffic count was down by 12, 200 vehicles when the samples were collected. In March-April 2002, the air quality study was conducted again and the average incremental $PM_{10}$ impact from the U.S. Plaza on the lower Westside community was 8.9 $ug/m^3$. The average daily traffic count increased by 3,911 vehicles per day from the post WTC event sampling period. These average incremental $PM_{10}$ values were a small percentage of the total average $PM_{10}$ daily measurements which ranged from 31 to 33$ug/m^3$ downwind from the U.S. Plaza.

The $PM_{2.5}$ measurements indicated there was a slight increase that was attributable to motor vehicle emissions from the U.S. Plaza. The average incremental $PM_{2.5}$ impact from the U.S. Plaza on the lower Westside community was 4.8 $ug/m^3$. The average $PM_{2.5}$ daily downwind measurement was 15.2 $ug/m^3$. All of the sampling conducted for $PM_{10}$ and $PM_{2.5}$ at any of the monitoring locations were below their respective National Air Quality Standards (NAAQS).

The elemental analysis conducted on the particulate filters was largely inconclusive. However, the elemental carbon analysis indicated that the contribution of U.S. plaza emissions slightly increased PM10 concentration at downwind locations in the Westside community and was likely vehicle related.

The Health Effects Institute (HEI) released a study in 2011 entitled Air Toxics Exposure From Vehicle Emissions at a U.S. Border Crossing:

[34] Buffalo and Fort Erie Public Bridge Authority (2007). Peace Bridge Expansion Project , Draft Design Report, Draft Environmental Impact Statement, Draft Section 4(f) Evaluation, Draft Section 6(f) Evaluation, Appendix A – Air Quality Analysis (US)

Buffalo Peace Bridge[35]. The Health Effects Institute (HEI) has conducted a number of high quality studies in the United States and around the world to investigate the impacts of mobile source air toxics (MSATs), including diesel powered vehicles on public health. This study was conducted over a couple of weeks in 2005 and 2006. The scope of this study was more comprehensive than the commissioned DEIS study described above. It involved air quality monitoring at fixed site locations in the Westside community around the Peace Bridge and U.S. Plaza. Monitoring was conducted for more than one hundred individual chemicals including particulate matter (ultrafine PM, $PM_{2.5}$ and $PM_{10}$), elemental composition of PM, volatile organic compounds (VOCs), nitrogen based polynuclear aromatic hydrocarbons (NPAHs) and polynuclear aromatic hydrocarbons (PAHs) over various time periods. The sampling campaigns were of short duration, one week in January of 2005, two weeks in July 2005 and two weeks in January 2006. In addition, backpacks equipped with samplers (mobile monitoring) to measure ultra fine particles (UFP) and particle bound PAHs were worn by volunteers as they traversed the streets of the Westside community.

The PM sampling at the fixed sites can be compared to the results from the DEIS study while accounting for some specific limitations, which include sampling time and sampling methods. The fixed site samplers were operated for 12 hours per day during the peak traffic count times (7:00 AM until 7:00 PM) during the weekdays. The pooled $PM_{10}$ samples indicated the average incremental $PM_{10}$ level from the U.S. Plaza on the lower Westside community was 4.7ug/$m^3$. The pooled $PM_{2.5}$ sampling indicated the average incremental $PM_{2.5}$ level from the U.S. Plaza on the lower Westside community was 2.3 ug/$m^3$. The incremental increase in $PM_{2.5}$ was attributed to the elemental carbon fraction from vehicle traffic. These values are 47% and 52% lower than the average $PM_{10}$ and $PM_{2.5}$ incremental contributions in the community measured during the DEIS study in 2001 and 2002. Sampling time (12 vs. 24 hours) may account for some of these observed reductions or it could be related to improvements in traffic flow and the reduction of standing traffic at the U.S. Plaza since the toll booth was relocated to the Canadian side of the border in Spring of 2005. PM and elemental carbon were also measured during the evening hours during times of lower traffic counts and resulted in lower levels.

The VOC analysis clearly showed that motor vehicles were the dominant source of air toxics at the fixed sampling sites in the Westside community. The ratio's of benzene, toluene, xylenes and 1,3- butadiene exhibited a clear vehicle emission fingerprint. The elemental analysis of the $PM_{2.5}$

[35] Spengler J, Lwebuga-Mukasa J, Vallarino J, Melly S, Chillrud S, Baker J, and T Minegishi (2011). Air Toxics Exposure From Vehicle Emissions at a U.S. Border Crossing: Buffalo Peace Bridge. Health Effects Institute Research Report Number 158. Boston, Massachusetts.

filters indicated that calcium, chromium, manganese, iron, copper and antimony were elevated at the fixed monitoring site closest to the U.S. Plaza. The emissions were attributed to road dust resuspension, tire and brake wear and vehicle exhaust. The mobile monitoring effort identified elevated concentrations of UFPs in the area around the U.S. Plaza and community roadways (which are also in close proximity to I-190). This finding is not inconsistent with other studies that have demonstrated elevated UFPs within 50 meters along roadways that are associated with vehicle emissions.

In summary, the HEI study provides good information that can serve as a baseline assessment of motor vehicle air toxics in the Westside community. This information can be used to assess air quality improvements that are being predicted to occur as a result of improvements to the traffic flow over the bridge and the regulatory requirements that are gradually being phased in for gasoline and diesel powered vehicles overtime.

*Future Ambient Air Quality*

The overall goal of any plaza improvements is to further reduce or eliminate vehicle idling and backups at customs inspection stations coming into the U.S. while also accommodating any future increases in the number of vehicles using the plaza. Vehicles that are stationary on the plaza and idle for extended periods of time due to lack of Customs processing capacity create "area" source of emissions. These emissions will drift downwind into the areas surrounding plaza. When traffic is kept flowing through the plaza and not permitted to sit idling for any length of time, these "area" emission sources do not form, and therefore lessen the opportunity for emissions from the plaza to enter surrounding areas. Carbon monoxide (CO) emissions are directly affected by traffic flow.

A similar situation can be found with Particulate Matter (PM) emissions. PM also impacts a limited or localized area. A study in Windsor Ontario near the Ambassador Bridge found that under the worst conditions traffic PM particles were not found beyond 900 feet from traffic lanes; with less congestion and weather conditions that help disperse pollutants, the distance from the roadway affected by PM was noticeably shorter.